Challenges and Opportunities for Sustainable Energy Solutions in Rangelands - *Experiences & Lessons from the Hindu-Kush Himalayas*

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Hindu-Kush Himalaya (HKH) is spread across eight countries in Asia namely Myanmar, Bangladesh, Bhutan, China, Nepal, India, Pakistan and Afghanistan.

It is likely that no other region in Asia will suffer as much from changing climate and looming energy crisis as the high altitude cold areas of HKH region (mainly rangelands), where living conditions are harsh and many people vulnerable and marginalised. The upper belt of HKH region lies at an altitude of over 3000m above main sea level. The temperature can drop as low as -30°C in winter. Natural resources are scarce; however, demand for energy is high, especially for heating and cooking. Herders can not survive the winters without fuel. There is heavy pressure on bushes and scrubs due to overexploitation, overgrazing and uprooting. People rely heavily on animal dung for cooking and heating, which causes adverse impacts on fragile ecology and environment. Women and children face disproportionate burden of energy crisis. They spend long hours collecting animal dung and bushes. Besides lost opportunity, they face serious health hazards from cooking in a smoky environment.

The following diagram shows that the biomass growth rate decreases with the altitude, whilst energy demand increases concurrently.

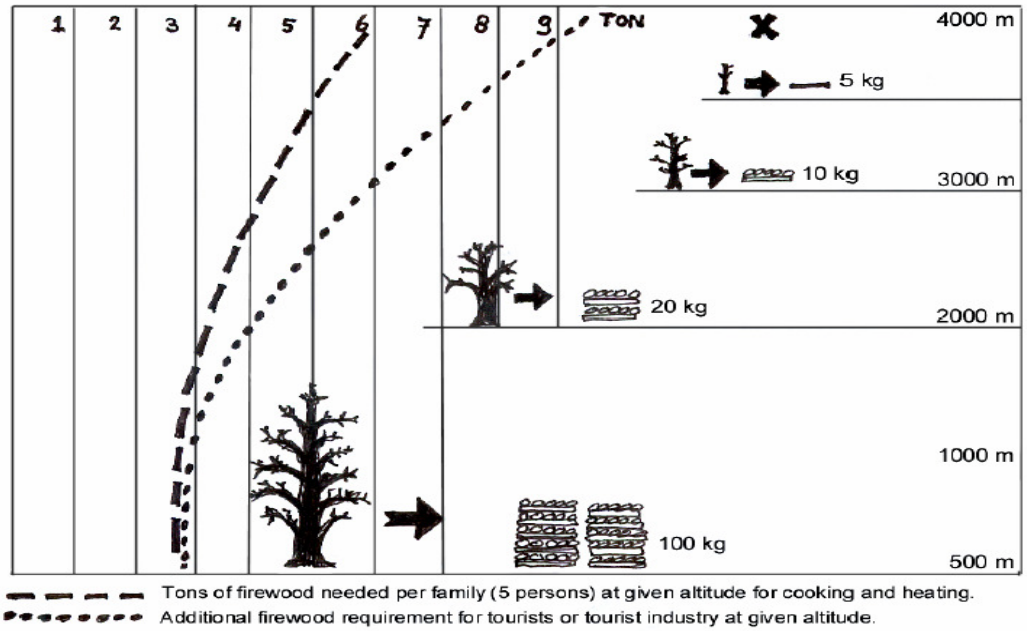


Figure 1: Low biomass productivity- extremely slow growing period in high altitude rangeland

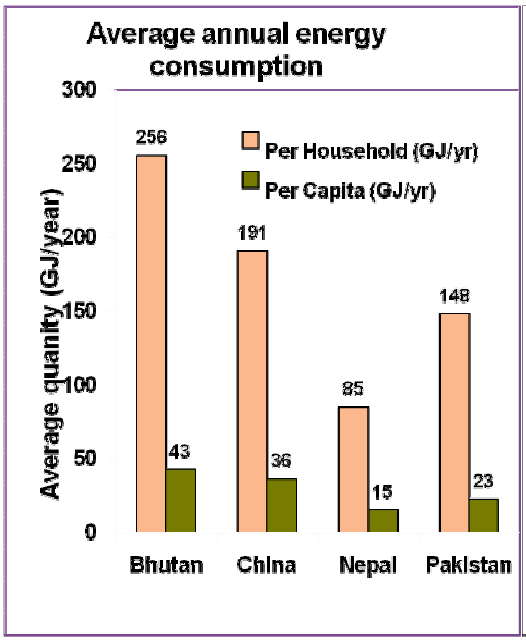
Rangelands contain the largest ecosystem in the HKH region, occupying 65% of its land area, providing enormous ecosystem services to more than a billion people downstream while regulating global climatic pattern. Despite this, they are still largely excluded from government planning and development spending. The rangeland poses many barriers - physical, economic, socio-cultural and political towards sustainable development. Physically, the villages are so remote and secluded that accessibility is difficult. Prevailing poverty makes technology unaffordable. Even if technology is viable, it may not be affordable and acceptable, due to these barriers. Sustainable energy service provision calls for harmoniously addressing the three broad criteria of sustainability – availability, affordability and acceptability (3A).

ICIMOD has conducted a research work in 2007-08 called "Development of Sustainable Energy for Rangelands (DESER- Phase I)". The objective of the project was to design and support development of environmentally friendly, socially equitable and economically sustainable energy resources and technologies in rangelands to enhance livelihoods of people and their environment. Its immediate objectives were to assess household energy needs and supply situation, and to carry out onsite testing and demonstration of feasible energy technologies.

We selected four sites in four different countries for the pilot research. These sites and partners are:

a) Soi Yaksa, Nubri, Bhutan (Department of Livestock)
b) Hongyuan County, Sichuan, China (Sichuan Academy of Grassland Science)
c) Upper Mustang, Nepal (National Trust for Nature Conservation)
d) Momi, Chitral District, Pakistan (Agha Khan Rural Support Programme)

The baseline survey showed the bitter realities of energy vulnerability at the project sites. Average annual energy consumption is very low. Energy use per household is highest in Bhutan (256GJ/yr) and lowest in Nepal (85GJ/yr). The detail figures on average annual energy consumption per household and per capita are shown below in the following charts.



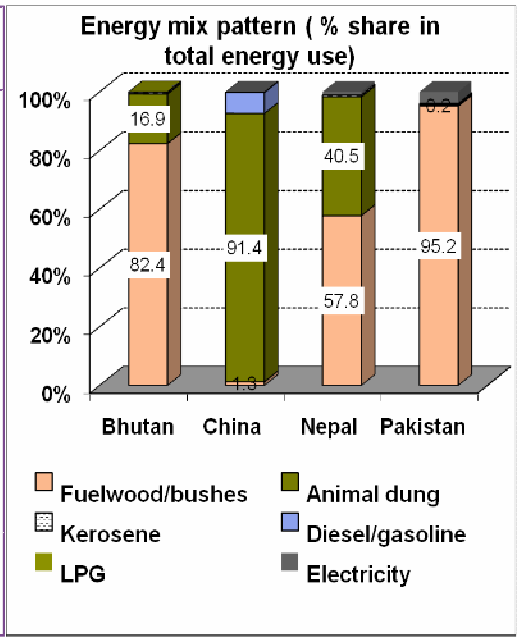


Figure 2: Average annual energy consumption
Figure 3: Energy mix pattern (% share in total energy use)

Persistence reliance on solid fuel is hallmark of poverty. In Bhutan, 82.4% of the energy demand is met by firewood and bushes, and Pakistan (95.2%) has similar situation. In China, 91.4% of the energy demand is met by animal dung and in Nepal there is a mix use of animal dung (40.5%) and firewood (57.8%). Women spent on average from 3 hours (Bhutan and China) to 7 hours (Nepal and Pakistan) per trip to collect fuel.

In Pakistan, a family spends 13% to 22% of the income on energy. In China, it is on average 8%, Nepal (5%) and Bhutan (1%). These mountain people are among the poorest in the world. This means, their capacity to invest in energy is low whilst the requirement is high. The analysis further shows that energy transition pathway is not straightforward and linear due to complex structural factors beyond income. This means, energy mix strategies for multiple cooking and heating are required away from the linear fuel switching notion of conventional energy ladder model.

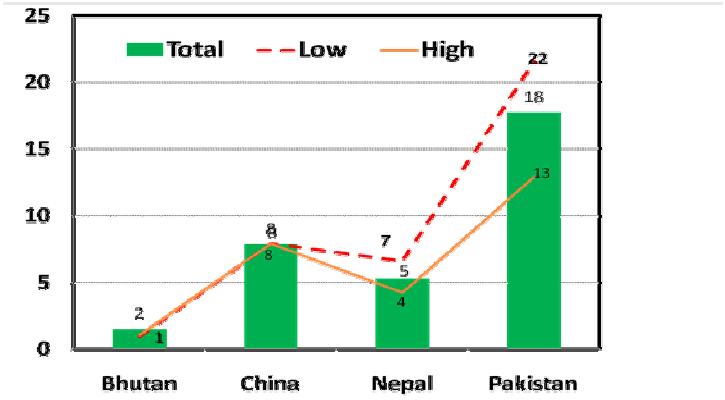


Figure 4: Energy Budget Share by income

The pilot experiment of improved metallic stoves, solar cookers and portable solar lamps showed vast potential for saving fuel, reducing indoor air pollution and GHG emission, freeing up the excessive time and reducing drudgery of herders especially women for productive activities. Three types of improved metallic stoves tested for cooking and space heating showed an average daily fuel saving of 25 to 60% except China (12-17%) where people were already using some form of improved stoves. Given the baseline annual solid fuel use of 6.4 to 17 tons per household and annual GHG emission per household of 10 to 35 tons CO2 equivalent, potential impacts of the fuel efficient stove are high due to their multiplier effects. However there exists trade-off between increased cooking efficiency and loss of space heating from a single stove. To overcome this, it is important to increase energy efficiency in domestic housing through improved insulation.

Solar parabolic cooker tested was able to save 6 to 12 kg of fuel per day. However households need to adapt to new ways of cooking as the process takes place outdoors and is dependent on good sunlight. As such solar cookers need to be promoted as a complementary rather than replacement technology for traditional cooking. A low cost small solar home system (two lamps with 4W LED each) were suitable for the semi-nomadic rangeland community to replace kerosene and dry cell battery as they are portable, and extremely durable producing a bright clean light for study and work.

For herder communities to adapt to climate change, they need to exploit new energy sources, make better use of existing biomass sources, and reinvigorate their own resilience enhancing adaptation practices. ICIMOD believes that properly designed renewable energy options are both a mitigative and adaptive response to climate change as they address core sustainable development priorities and build adaptive capacity, without increasing greenhouse gas (GHG) emissions – a win-win opportunity. Policies for sustainable energy solution need to focus on a) improving efficiency with which these solid fuels are used, b) promoting more sustainable way to supply these biomass resources, and c) facilitating the transition to the modern fuel by making them physically available, economically affordable and socio environmentally acceptable. Energy

provision is not merely technology provision; it is about empowering local herders (both women and men) through building capability, creating economic opportunities, and enhancing their organisational strength to have a voice in shaping their energy choice – a lengthy process, which requires a long-term programmatic approach.

Building on these pilot experiences, ICIMOD in its second phase (2009-2012) is working to scale up of the tested technologies within project areas of five countries (Bhutan, China, India, Nepal, and Pakistan) in preparation for the programme into the remaining areas of the HKH through commercialization and market development. The project seeks to tackle the challenge of sustainable dissemination and commercialization through strategic policy, institutional and technological innovations to fit the specific local context. It aims to create enabling mechanism required to ensure multi-stakeholders' partnership for addressing availability and affordability issues through innovative financing, suitable production and delivery system in order to establish convincing good practice demonstration model that is sustainable, replicable and scalable across the HKH rangelands.

References

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2. Sharma, B and Banskota, K. 2009. Development of sustainable energy for rangeland in the Hindu-Kush Himalayas Baseline study Report on Household Livelihood and Energy Situation, Submitted to Austrian Development Agency, Vienna, Kathmandu: ICIMOD.